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AUTHOR Sparks, Judy
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ABSTRACT

Of two-dozen pavilions at Expo 70 visited and observed for their film presentations, in only one case was the film displayed on a single screen of standard shape. This exception was the Russian three-dimensional film. All the other films were shown on wide screens or multiple screens. Screens were side-by-side, above and below each other, facing each other across a stage, flat on the floor, composed of leaves, and composed of seats. They were square, triangular, round, hemispherical, and spherical. Screens were reflected by giant mirrors into infinity--before, behind, upward and downward. Multi-image projection was used with varying degrees of effectiveness. Rotatable panels and electroluminescent panels were used. Audiences viewed the films walking through pavilions or riding through them or sitting down. The spectacular film projections were accompanied by spectacular sound, coming from all possible directions. In addition, the wide use of synthesizer music brought many new sounds to the ear. Besides visiting Expo 70, the author met with the television producer and head of English language teaching at Nippon Hoso Kyokai (NHK). A history is given of NHK's accomplishment in teaching English. (KT)

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The following report is based on a ten-day trip to Japan during which four and a half days were spent in Osaka observing the uses of film and associated display methods at Expo '70 and two days were spent in Tokyo visiting the new facilities of NHK and talking with some of the producers of educational programming for the NHK-ETV network. After the first day at the fair, during which much of the time was spent waiting in line to enter pavilions, help was sought from the U.S. pavilion staff, and eventually a press pass was obtained which allowed almost immediate entry into any pavilion. With this aid it was possible to observe a total of 28 pavilions out of the 99 which made up the exposition. This was the fourth World's Fair I have visited, and was apparently the largest, certainly the most interesting from the media standpoint, and easily the most crowded.

It is safe to say, as most reviewers have, that most, if not all of the pavilions made use of the motion-picture medium somewhere in their exhibits; I visited two dozen in which film in one form or another was the major attraction. In some of these, however, was the film displayed on a single screen of the standard shape. An exception was the Russian three-dimensional film which was displayed on a special lenticular screen three by four meters in size where it was viewed without glasses. Whereas this system has been in use for many years in a Moscow cinema, this is the first time it has ever been demonstrated outside the Soviet Union.

Two journals in the motion-picture and photographic field had published elaborate articles describing the films at Expo '70: *Industrial Photography*, May 1970, and *The American Cinematographer*, July

1970. The latter devoted the entire issue of 128 pages to this single theme. Thus I knew what to look for, where to visit, and where I wanted to spend the most time. It was these articles, of course, which determined me to make the trip in the first place. I had also obtained a copy of "Seeing Expo '70, Guide to Japan World Exposition" which served as a useful reference book. The availability of the first two descriptive articles specifically on the films that were shown greatly reduced the amount of information-gathering which I would have otherwise found necessary. This report will reference these articles and draw on them frequently, but will go beyond them into the area of criticism more than description. It will be my purpose to generalize on what is to be seen at Expo '70, evaluate the relative effectiveness of the various systems and techniques of display, and to project these developments into the future. A distinction will be drawn, as far as possible, between those display methods which have application mainly to large exhibitions such as this one, and those which appear to point the way toward the future development of the motion-picture medium in general.

All films at Expo '70, with the exception of the Russian 3-D film, as I have already noted, used either wide screens or multiple screens. Multiple images were used on single wide screens; single panoramic images were created from separate films on separate screens. Screens were side-by-side, above and below each other, facing each other across a stage, flat on the floor, composed of lenses, composed of smoke, square screens, round screens, hemispherical screens on which images were projected, full spherical screens with the projection coming from the inside, 360-deg screens that surround the audience, a full

theatrical screen that covered the audience with a great deal of projection, and most overwhelming of all, screens that were surrounded by giant mirrors that infinity before, behind, upward and downward so as to totally envelope the viewer in each direction of each of the three dimensions. Some of these, of course, were technological demonstrations. Others were deeply moving or visually magnificent. Each succeeded in its own way in being highly impressive.

Most of the films at this exposition, as at any World's Fair, attempt little in the way of cognitive communication. Having the purpose, generally, of promoting some large industry, or government, and knowing that the audience is there for only twenty minutes, out of a day filled with a kaleidoscope of exciting sights and sounds, they attempt to make some kind of emotional impression--in other words, to be impressive. Thus the visitor encounters a barrage of sensory stimuli each competing with the last set of stimuli to be the most beautiful, the most stunning, the most moving, the most impressive, the most memorable. But because, at a fair, so much follows heading after so much, most of the stunning displays do leave people stunned, and seem to compete only in being the most colorful, the most unusual, the loudest, the brightest, the most completely surrounding, or just simply, the biggest.

Large-screen or multiple-screen film is a pretty good way of being impressive. Sheer size in itself can be thrilling. Size is a matter not only of actual dimension, but more of the angle of view, both horizontally and vertically, which the screen can fill at the viewer's eye. There are large drive-in movie screens in California

which have more than twice the screen area of the largest wide screens at Expo '70, but because they are seen through the windshield of a car some hundreds of feet from the screen, don't seem particularly large. The average viewer at a drive-in, parked half way back, takes in the wide screen with about a 30-deg angle of view. Most of the screens I viewed, from where I sat at the back in order to take pictures, subtended at least twice this angle of view, and for most of the viewers considerably more than this. In the Fuji pavilion, where the audience entered beneath the screen, it was at first gigantic as one looked up over his shoulder at it. The audience then stood on a slowly moving turntable and looked up at the 82-by-65-ft screen with an angle of view of 90 deg. In seven or eight minutes the turntable had revolved halfway around the pavilion, and carried the viewer back to where the screen was only 30 deg wide. In another seven minutes he was back up beneath the gigantic screen again, the film had returned to the point where he came in, and he was directed off the turntable and made his exit. The film itself was such a moving experience, however, that I insisted on staying on the turntable and saw the film through four times, and then came back two days later for another two or three viewings. There were other films at Expo that warranted repeated viewing; if I had had another few days I would have spent them in this fashion.

The films that were devised for these monster shows were surprisingly effective considering the fact that they almost all represented some kind of new motion-picture system for which all elements were being designed and brought into being for the first time. In many cases

some sort of special new camera had first to be designed and built before the film could be made--made for a projector which had not yet been built, for a screen and projection hall that existed only in architect's sketches. Planning must have started even after Expo '67 [illegible] of the same filmmakers were involved who did spectacular for that exposition; shooting of most films began in early 1968 and ended early in 1969. Then special editing equipment had to be devised in nearly every case, and the filmmaker had to construct a film for a system he had never seen in operation for a place that was yet to be. Only one with powerful imagination could have done it. Only one with great artistic sensitivity could have achieved the dramatic effects which these three-time films often conveyed.

Roman Kroitor, who with Colin Low, famed Japanese film director, produced the Fuji pavilion film, was responsible for the big multi-image show of the National Film: "Labyrinth." The director of the Fuji film, Donald Brittain, was a consultant for three pavilions at Expo '67. Doris Chapman, who won an Oscar award for the Expo '67 film "A Place to Stand" made an excellent multi-image film for Expo '70 which was projected on a single large screen in the Ontario pavilion. Barry Gordon who also worked on "A Place to Stand" photographed and edited the Washington State film.

There were other visual-display techniques that projected images used. In the Canadian pavilion, for instance, the audience was seated before a "multimedia wall" on which various areas containing transparencies, three-dimensional objects, symbols, prints, etc., appeared to

synchrony with an audio presentation. The direct-viewing transparencies (with transmitted light) for photographic subject matter, were able to present more brilliant, sharper images than any projection could provide. When these were divided into rectangle panels, in the manner of some freeway billboards with which we are familiar, at least three different images could be presented within the same screen area. In the Japanese Government pavilion a complex show, "Japan in Miniature," was presented on a large wall by means of square-shaped, rectangle units of direct-viewing transparencies about a foot square. The most effective use of direct-viewing transparencies was to be seen in the Russian pavilion where a transparency running from floor to ceiling and at least 30 or 40 ft wide covered the end of a large room, giving the effect of looking down on a sun-drenched wooded mountain valley with a rushing river, framed by the trunks of pines.

The use of electroluminescent panels made possible a kind of automated mosaic at the Canadian pavilion where it was limited to shades of green. A similar mosaic in multiple colors but smaller screen area was used at the Belgium town as part of their "movie show." To provide this kind of display, an area is covered with "electroluminescent panels" which are available commercially. I find, in sizes between 3/8 in. to 1-1/2 in. long.[2] It appeared that something near the largest of these sizes was used in both the Canadian exhibit and the Belgium tower.

While the Belgium tower show used these mosaic panels only for the presentation of abstract designs, they were color panels and quite brilliant, seemingly capable of a very wide range of colors. While the

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[2] Poole, Harry G., "Fundamentals of Display Systems," p. 110, Spartan Books, Washington, 1966.

Canadian exhibit was somewhere, capable only of a range of tones from black to full brightness, it was composed of some 10,000 units. It was programmed by the projection of a short motion picture. "The City," onto a light-sensitive panel composed of screens controlling each luminescent panel. In this regard it was similar to but more sophisticated than the animated board composed of a few hundred electric lights which has been a feature of New York's Times Square for over 30 years. The electro-luminescent screen is capable of much more subtle effects and is greater variety than the simple on-off-light light board, because of the range of tones or colors which is possible.

From the standpoint of the motion-picture medium, multi-image presentations can be classified into two basic: (1) those that use multiple screens or projection areas and multiple projectors and films, and (2) those that use a single projector and film and project on a single large screens.

Of course, multiple films and projectors may be used to project onto a single large screen, but I shall place this technique along with the use of multiple screens in the first category. This was done at Expo '70 at the Japanese Local Governments' pavilion where visitors were seated in spherical "air-capsules," each accommodating six persons, and were carried around the periphery of a long room, watching one projected image after another on continuous screens mounted on the opposite side of the room. Most multimedia presentations now being done with film and motion pictures in industries and by the universities in this country are done on single wide screens with multiple projectors.

There were no instances of single films from single projectors being used to illuminate multiple screens. There was one case, however,

the lone film "Tiger Child" at the Fuji pavilion (discussed in greater detail elsewhere in this report) in which a single film was subdivided into three vertical segments or nine smaller segments, with thin black lines between, giving an impression of multiple-screen projection.

The multiple-film, multiple-screen shows will be discussed separately from the single-film, single large-screen presentations, since the former appear to be unique systems designed from camera to screen for one specific application at one exhibition, and which may never reappear again in exactly the same form. The large-screen, single-film systems, on the other hand, appear to hold promise of developing into distributable, broadly reproducible extensions of the sound motion-picture since, and have exciting implications for the future of the film medium.

Few of the major exhibit pavilions were content to present an ordinary single film image on a single screen. Each presentation had to be, in some fashion, a spectacular. Wide-screen film, even Cinerama and Dimension 150, have become commonplace in urban cinema theaters today, whether Orient or Occident, Soviet film or Western. In the Soviet cinema theater a selection of wide-screen Soviet films was shown throughout the day, admission was by separate entrance, not dependent on entrance into the main pavilion itself, for which a two-hour wait was standard.

The major Canadian film, "The Land," was a single-film, single-screen production, but this was spectacular in another way: The screen was 48 ft wide, 24 ft high, and rectangular. This was evidently the architect's idea; it exactly fitted the end of the room up to the ceiling. How does one make a film for a rectangular screen? Does Twelve,

the director, writes that "It soon became apparent--through testing--that static shots, pans, and tilts just drew attention to this awkward shape, so we had to devise a style which would turn the format to advantage. This we did by almost exclusively using movement--toward or away from the camera--at speed. The frame then became a sort of tunnel through which the audience would be continually traveling." Because Fisher had by no means entirely eliminated pan and tilt shots, it was possible to observe just why they didn't work and why dolly shots did. A pan shot on any screen, at least of fairly nearby subject matter, causes a lot of subject matter to enter and leave the screen at the sides. At the apex of a triangular screen there is very little screen width for subject matter to cause between its appearance and disappearance, and this became very frustrating to try to watch. The same applied to tilt shots at the bottom sides of the screen. Motion forward, however, meant that small distant subjects at the top of the screen expanded as we moved closer to them and also moved naturally to the lower part of the screen, which was conveniently wider to receive them in their enlarged form. There was an absolute minimum of things entering or leaving the screen, except at the very bottom. The triangle is the normal shape that an area of equal width will appear as it recedes into the distance, e.g., visualize a shot of a set of railroad tracks dwindling upwards to vanish in a single point on the horizon. Thus, the natural answer to how to present a picture of Canada on a triangular screen was to mount a camera in the nose of a plane and fly over the land. So perfect was the match of frame shape and action in these forward-moving shots that it seemed as though anything but a triangular screen would be totally unsatisfactory for the purpose.

Multiple-Screen Presentations

Probably the most effective multiple-screen presentations were the ones which massed all screens together in a row, or in two rows, one above another, or in one case three horizontal rows. This always required thin black lines dividing one screen from the next. The major advantage of massing the screens was that panoramic shots utilizing all screens as parts of the same image were possible. The film "Japan and the Japanese" in the fifth pavilion of the Japanese Government complex, massed eight screens together in this manner, in two horizontal rows. The Suntory pavilion massed six screens together, two wide and three high. The Toshiba pavilion and the Australian pavilion each used a single row of nine screens and nine projectors in a complete circle surrounding the spectators.

There were some multiscreen presentations in which the screens were placed opposite each other, or at right angles to each other, either on adjacent walls, or wall and floor. The Gas pavilion contained an auditorium in which two audiences faced each other across a complex of screens, one on the floor, one on either side of the stage, and one, double sided, which descended briefly from the ceiling.

The Automobile Industry pavilion massed three large screens together, with a fourth, shaped like a blunt wedge, slanting up the ceiling over the center screen and the first few rows of the audience. It was used only intermittently when it was appropriate to the action, i.e., when something was shown from underneath, or when a full visual display on all screens was important to the emotional effect.

The Netherlands pavilion demonstrated the most complex use of multiple screens. Here some 35 screens of various sizes and shapes,

13 of which displayed continuous motion pictures, were accessed as the viewer moved through the building, up escalators, along balconies, through rooms, and up more escalators. Some were side-by-side, some faced each other, some were on adjacent walls, but all were separate screens with separate 35mm film projectors. To minimize ambient light the entire interior of the building was painted black, but there was no way to avoid one screen casting light on another screen when they were sometimes less than one or two screen widths apart on adjacent walls.

Single Screen Multi-Image Presentations

The most significant film development, in my opinion, lay in the area of single-film presentation on a wide screen. Seventy-millimeter film, twice the width of the old theatrical standard, is now commonplace and has become the standard of the larger cinema theaters throughout the world. At Expo '70 the film spectacular that did not use 70mm film was the exception; those that used standard 35mm film were rare. If 16mm was used it was as a slide-show display, running as an automatic continuous loop projection on a small screen as part of some larger exhibit.

The Fuji pavilion, the Soviet Union's "Panorama" presentation, the Ontario pavilion, and the State of Washington, among those which I was able to visit, all used a single 70mm film into which multiple images were incorporated. When this means is used the size and shape of the images may range between wide limits, the frame may vary in size or shape during presentation, and in the case of the Chris Chapman film at the Ontario Exhibit, the frame may move across the screen

against a black background. Chapman moved the frame to follow action, thus providing a unique cinematographic effect. Usually when the camera pans with a subject, the subject holds the same physical area on the screen, while background or foreground objects cross the field in the direction opposite the panning. In the case of Chapman's moving frame, background objects remain fixed in reference to the screen, while the moving subject and the boundaries of the frame itself move together across the screen. In one instance after the frame covered the screen following the slow motion of a ship through a canal, he held the leading edge of the frame stationary and continued to move the trailing edge so that the frame grew narrower and narrower until it wiped itself out. Moving the frame to follow action appeared to be a very pleasing technique; the viewer can continue to hold his eye comfortably on the moving subject, whose speed and extent of movement are graphically displayed. Meanwhile, the elements of foreground or background retain a fixed position on the screen as the frame moves past. This is quite a different effect from what we are used to in film or television. In contrast, the traditional film technique of "panning with action" when displayed on a standard screen, puts the moving object on a sort of treadmill, holding it still in the center of the screen while the background goes whizzing past.

The frame is very important to the picture. Indeed, if an image does not have a frame (i.e., a clearly marked boundary beyond which there is no further image) it may well be questioned whether it should be called a picture at all. The art of pictorial composition closely consists in relating elements of the scene to the surrounding frame.

three stage design within the frame of a presentation is quite a different artistic problem from screen staging where objects are related only to each other in space. To the photographer, the ability to frame his image means that he can 1) choose the size, including only those elements of the scene which he wishes to use, excluding irrelevant details, 2) emphasize some portions of the scene by eliminating the others, and 3) by choosing how he places the frame against the scene before him, relate subject and frame to pleasing pictorial composition. Heretofore the art of pictorial composition has applied largely to relatively static pictures, where relationships are held long enough to be perceived and appreciated. Now with Chayman's moving frame the editor can apply the same artistic controls to subjects that are in motion. Another interesting difference is that since this kind of a film must be assembled by optical special effects, pictorial composition becomes a concern of the editor, really, more than the cameraman.

A quite different type of multi-image presentation via a single film was demonstrated in the film "Harmony of Nature and Man" produced by Eugene Tilton for the State of Washington pavilion. Tilton consistently filled the entire screen with panoramic scenes instead of a black background, adding additional images by inserting them into this photographic background. In one example of this technique the background was an apple orchard with some children in the middle distance picking and eating apples. A small square insert then appeared at the upper right side of the screen showing a close up of two apples on the tree (the apples were too far away to show in the background longshot) while on the other side of the screen another square insert, more than

half the screen height this time, presented a very large close-up of a mouth biting into an apple, accompanied by close-up sound."

While this example, along with a few others, was successful, by and large I felt the Immy technique was a weakening rather than a strengthening factor to the film. Framing of one image by another is a kind of photomontage which is difficult to do well, even in still photography. In the film it is reminiscent of the composite home action slide backgrounds that were introduced years ago. The Immy seems somehow pasted onto the surface of the larger picture; it calls attention to this surface and hence holds one's involvement on a superficial level. It is as though the viewer were prevented from fully entering into the depth and the illusion of the large-screen picture. Barry Gordon, the cinematographer/editor on the picture expressed some of these doubts when he wrote of the Immy technique: "I don't know if this is actually a step forward, but I think it is."[10] It may be a step forward all right, but in the wrong direction.

The Imax Format

Of the many excellent films I saw, much the most impressive was the film exhibited in the Fuji pavilion using the new Imax projector and format developed by the Canadian firm of Multiscreen, Inc. Despite the company name, Imax is a single-screen system, using an aspect ratio of 1 to 1.43, very close to the old standard of 1 to 1.33 (3 x 4 ratio). Thus, the screen is not a wide screen, but of the ordinary shape; it makes no attempt to surround the viewer and present him with visual stimulation

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[9] See *American Cinematographer*, July 1970, p. 691.

[10] Ibid., p. 709.

to areas of peripheral vision. The Fuji screen was large, however, 40 ft high and 82 ft wide, and because spectators watched the film from a slowly moving circular turntable, they each saw the film from varying distances with viewing angles varying between 30 and 80 deg. With such an apparently gigantic screen it was possible to divide it up into as many as nine segments on some occasions, three vertical panels at other moments, in addition to the use of occasional full-screen shots. But all nine segments were always used at once, nor all three panels. Often the screen was largely black. The nine-segment format was not used to display nine different images, except when they were all of the same subject--e.g., nine different shots of wild giraffes.

A thin black line was used to divide one segment from the next in the nine-segment format, and one panel from the next in the three-segment mode. This provided the much needed pictorial frame. Without this black line the frameless images might have ceased to be individual pictures, and tended to blend into one another like a photomontage.

As a single-film, multi-image system, Imax appears to have as much or more potential than the wide-screen multi-image systems, despite its rigid format. At the Fuji pavilion the film on the screen was supplemented by slides from 20 automated projectors covering the curved walls and ceiling of the huge balloon-like building. The building was a series of arches made of inflated tubes each 13 ft in diameter and the slide projections fell directly on the curved walls of these great beams filling the cavernous room with images--and ambient light. The special

Imax projector, the first of its kind, used a 20,000 watt light source to combat all this stray light. In the future (and without the surrounding slide display) the firm expects to be able to cover a screen four times the size of the one used in Fuji, with only 3 or 10 more kilowatts of light.

There were dramatic moments in the film when full ceiling changes coordinated effectively with the film. Most of the time, however, any change in ceiling image distracted from the film. Between "reels," when out of focus abstract light patterns occupied the screen for a few minutes, attention could be directed to the ceiling projection, and at this point it was indeed effective, especially when the entire interior of the building was covered with, say, blue flowers.

The Imax projector was especially significant in the manner in which the film was moved through the projection aperture. Film projectors have always accomplished this nearly instantaneous change from one frame to the next by a quick "pull-down," moving a section of film far enough so that a new frame comes to rest in the projection gate, while a shutter momentarily interrupts the projection so the blur of the film motion does not appear on the screen. With 16mm film used elsewhere, fifteen perforations per frame, about four times as much film must move through the projector in comparison with 35mm projectors. Prior attempts to project films of this size failed to run at the standard 24 frames per second speed without tearing the sprocket holes out of the film.

Imax projection has been made possible by the application of an Australian invention--the rolling loop. In a rolling-loop projector (of which this is evidently the first example) there is no sprocket

pull-down, so another part of film from one frame to the next. Instead a loop or bulge is formed in the film, just one frame in length. The loop is then rolled along the film and across the projection aperture, leaving a new frame in projection position where the previous frame just lay. It is a concept which requires a motion demonstration to make perfectly clear. In the lens projector these loops are formed and rolled along by a circular component about two feet in diameter. Twenty-four loops pass through each second; each one takes less than a hundredth of a second to change the picture from one frame to the next, far less than any standard pull-down projector. This means that lens can project a more brilliant image, since the light level on the screen can be at least 25 percent higher than most projectors without stressing film.

Some Critical Observations on the Multi-Image Display Method

The idea of displaying multiple images is not new; it was not new when Expo '67 did so much of it at the World's Fair that made film history. Books have been written on the subject; university courses teach the production techniques involved. Yet is is new enough to most people to be exciting and spectacular. Is it only because it is new and different that it is so effective? Should it be classed along with cinerama screens, cinemiracle screens, and screens that lie flat on the floor, as nothing but World's Fair gimmickry? I think not. It appears to me that multi-image production, whether it involves still or motion images, opens up some new dimensions to the art of visual presentation which do not exist when only single screens are used.

Of course there is much that is added by sheer image size. We now

have the opportunity for the first time to look at a projected picture with the same wide angle of view with which we take in a double-spread picture in a popular magazine (90 to 75 deg). This has got to make a substantial difference in our perception of the projected picture, our involvement and projection into it, the intensity of the illusion of reality it can create, and because of all these and possibly still other factors, our emotional enjoyment of it. The usual average viewing angle of 15 deg with which we look at a film or slide on a conventional screen, or the average 7-1/2-deg television viewing angle, presents an image on the retina of the eye which is 1/28 or 1/30 the area, respectively, of a large-screen Expo '67 image that fills a 90-deg angle of view. But this is a function of screen size relative to audience seating. Multiple images may or may not be used. In fact, the large screen is more effective when it displays one large picture than when it presents two or more of smaller area. Most multi-media productions, whether they use one screen or several screens together, do not overlook the opportunity to project a full screen or multiscreen image whenever it seems appropriate to the subject. Even when the entire projection area is not covered by a single image, the fact that the multiple images stimulate some eighteen times as much retina as ordinary projected images does do something to the viewer that a single small screen does not do. Whether this adds to or detracts from the viewer's enjoyment depends, of course, on the presentation technique that is used.

I have seen enough multi-image presentations in which several visually unrelated things are going on simultaneously in several screen

screen, and I don't like them. There may be some thematic relationship intended between loading a cargo ship and a girl water-skiing. For instance, but there is little obvious visual relationship to tie them together. This kind of multi-image production is much like the running of two or more films simultaneously on adjacent screens. The worst example of this I have seen was a 360-deg projection at Bonefede in San Antonio in 1968 produced by the Ford Company. To convey the theme "The Ford 'family' of skilled workers," the standing audience was surrounded by a continuous screen which was irregularly subdivided into large and small images of various shapes, each showing a different kind of work activity in progress. There must have been 30 or 40 separate action images. Such a presentation is not something to enjoy. You must miss something since you can't look at it all. But you keep trying to see everything anyway and you only avoid total frustration because you are responding on such a very superficial level. Because you don't let yourself get interested in any one action for too long, and you keep running and looking at different images, you never can become involved in any.

It is probably true that the average person is not capable of paying attention to more than one thing at a time. Thus, if a multimedia presentation is to be a presentation and not a lot of conflicting presentations, each distracting attention from the next, it had better be edited.

In two Expo '70 pavilions where adjacent screens carried different images (the Japanese Government pavilion and the Netherlands pavilion) the audience was being encouraged simply past each screen in turn.

They know by this that they were intended to look only at the screen in front of them, and that there would be an opportunity to see the next one in a moment. This was considerably different from the multi-image presentations where the audience is stationary and several images are in view at once. It was even farther from the multi-image presentation which is presented in a free-flow area and people are allowed to look at whatever they like as they walk past.

Some Artistic Possibilities of Multiple Images

The conventional screen, subtending an average viewing angle of some fifteen degrees, has always been capable of displaying more than one image at once. The process was called, significantly, "split screen" rather than "multi-image." The screen was just a little too small, once it was split into two or more smaller areas, for these images to be independent pictures. Usually these areas did not have their own frames; one image formed the boundary for the next. Hence split screen was not a simultaneous presentation of two or more pictures, as multi-image is, but a kind of superficial photomontage where parts of images are put together in a sort of collage to create one composite picture.

One of two examples of "varioscope" film at the Russian pavilion divided up an odd-shaped screen into narrow, wide, or square-shaped segments running both vertically and horizontally, each containing a different image. As with any example of multiple images, the dilution of attention to any one image is in proportion to the number of images before the viewer.

The fact that the varioscope film was shown in the partially lighted space exhibit area, for casual, walk-past viewing, indicates perhaps that it was not intended to involve and enthrall the spectator, as films shown in theaters usually try to do. The net effect, in any case, was of an elaborate split-screen rather than a multi-image production. Why this truncated rhomboid screen (a parallelogram with its point up, cut off at the bottom) should be called varioscope is beyond me. The other example of varioscope (also projected in an exhibit area for casual viewing), lived up to the name by changing frame shape almost constantly.

What are some of the artistic effects that multiple images can achieve which cannot be achieved with a single succession of images? A few have become evident after repeated observation; there are undoubtedly many others that are already well known to the makers of such films. A simple one with which to begin could be called visual enrichment.

Multiple images which are all of the same subject, or all identical reproductions of the same shot, can support each other, and amplify each other. They can sometimes make a statement a little different from what a single image occupying the same screen area might state. In the Fuji pavilion film "Tiger Child" a sequence on daredevil stock car crashing ended with a driver waving his arms to the crowd. The same shot was repeated four times in a cross shape, in place of the nine-image format which had been black the previous moment. The use of many small images at once rather than a succession of large images in the usual film style, seemed to state a generality; instead of being concerned with one car, one driver, one episode, the multiple

image gave the impression we were considering stock car driving in general, making a statement about all such cars, all such drivers.

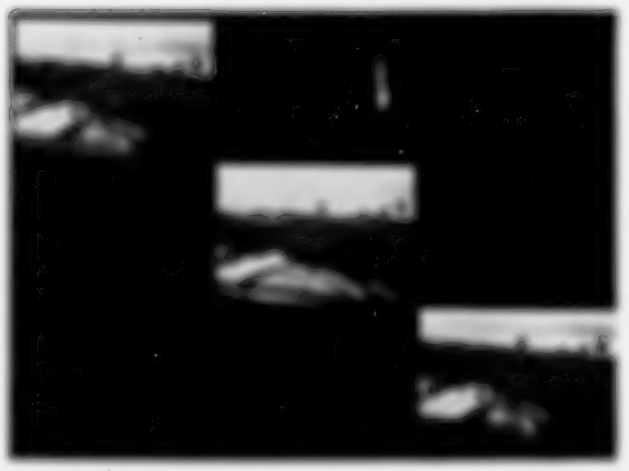
The most frequent type of repetition of images is seen when three pictures are shown at once, and the left-hand picture is repeated in mirror image on the right. If the side pictures contain motion this is often directed toward the center. The entire array of pictures, then, becomes a single composition, or as graphic artists call it when they arrange multiple images on a printed page--a layout.

A particularly well mounted sequence in "Tiger Child" can be described in detail, but first in order to describe multi-image montage some new terms will have to be understood. In most multiple-image layouts, one image at a time is generally dominant--that is, if the filmmaker has been able to control where the viewer is looking. When this image changes, or when all images change instantaneously, the change will be called a cut. When one or more supplementary images suddenly change to different images, but the dominant image is retained, the change will be called "replacement." When a new image is added to the layout, in a screen area which was dark before, this will be called an addition. Similarly, when a supplementary image suddenly disappears leaving a black area, the change is called a "vanishing." When the film-maker is dealing with dominant and supplementary images, the range of transitional devices open to him is greatly expanded over the traditional cut, dissolve, and fade. Each of these three transitions may take the range of forms described above for the cut, as shown in the table below:

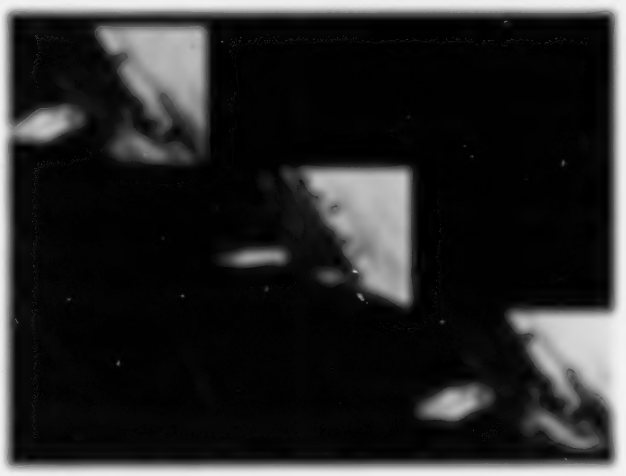
Effect	Treatment of all images	Supplementary images
One image instantaneously changes to another image	cut	replacement
An image suddenly appears where the screen was black before	cut-in	addition, appearance
An image suddenly disappears leaving a black area	cut to black	vanishing
An image slowly appears while its predecessor in the same area is slowly disappearing	dissolve	dissolve-replacement
An image slowly appears from black	fade-in	fade-in (addition)
An image slowly disappears to black	fade-out	fade-out (subtraction)

In addition, an image may "shift" from one image area to another, may repeat another image, either normally or in mirror image, or may repeat action just seen in another area.

In the final sequence I am describing, the nine-image format was used. The sequence began with a three-image repetition of a shot taken out the front of a car approaching a ramp.



Suddenly the bottom tilts strangely at a weird angle.



cut

We cut and the center area shows a car at a strange angle, riding on its two side wheels.

addition

Two more shots of the same action are added in upper right and lower left. Cut. The original upper left to lower right trio again, another car taking the ramp, seen from the side.

cut

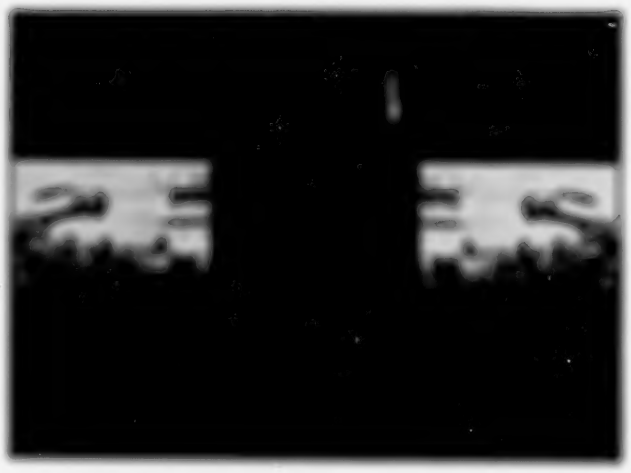
This time the same shot is used in all three areas but at different points in the shot, just a few frames apart. The action seen in upper left immediately occurs in lower right, then in the center. As the car in the center rolls and crashes,

vanishing and addition

the corner pictures vanish and side images simultaneously appear, one of which is the mirror-image of the other.

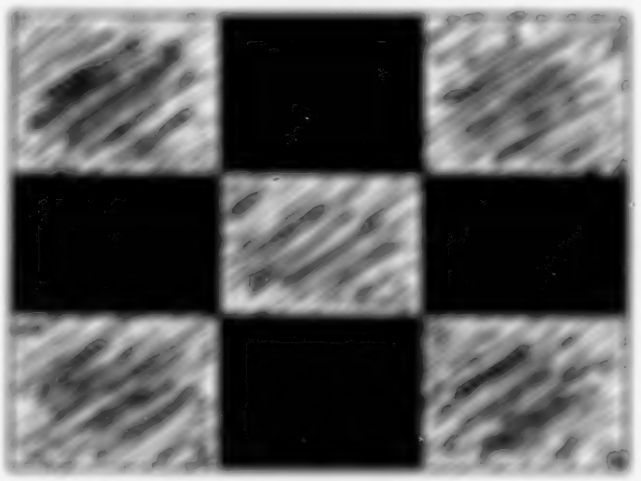
vanishing

Two cars close race in from the sides, hit a ramp, and sail through the air. The center image vanishes and the flying cars crash into a row of parked cars underneath.



cut

Cut to a brief moment of diagonal white in an X shape. (Diagonal white is utter visual confusion, produced by running the camera while moving it diagonally across the scenery.)



cut

Cut to a close shot, a driver pulls off his helmet and waves to the crowd.

Note that in building this sequence the editor kept the central area dominant and that cuts commonly placed a new layout of images in areas that were just previously black. Note particularly how actions could overlap; a second action could be well under way before the conclusion of a first. Thus the editor can compress time beyond what the traditional techniques of intercutting can allow. The creation of "filmic time" can thus be enhanced.

A powerful artistic technique, which can only be used when multiple images are possible, is the reinforcement of one image with another. I have described how repetition of identical shots increases the visual impact, much in the way that a row of dancers, all doing the same steps, even when seen from considerable distance, are more impressive than a single dancer can be. I have also described how similar but not identical shots (or the identical shot but not in synchrony) can express a generalization--say something about all such subjects--which a single image of a single concrete subject cannot do.

There have been a few instances where separate shots were used, taken obviously in separate parts of the world, in which the action appears to be related. The Fuji film "Tiger Child" contains a very humorous juxtaposition in which a uniformed and mounted Whitehall guard in the left panel of the three-panel screen, looks guardedly askance apparently across the central black panel at a closeup of a camel at the far right.

In the Telecommunications pavilion a similar thing was done with television. Twenty-one color TV screens were grouped on one side of a wall, next to them was another group of 21, and each group was simultaneously showing the same film, so that two films were being displayed. The theme, evidently, was the unity of mankind, a common theme in many presentations; here it was expressed by throwing a large ball back and forth from one film to the other. A group of French children in a park would receive the ball, for instance, then throw it back toward the camera. It would reappear in the other film,

rolling down to some bathers in a Polynesian lagoon. When they threw it back it was caught in the first film again by a group of African workers in the back of a truck, and so it went, for as long as one cared to watch.

Similar actions in separate shots can often make a generalization based on comparison. "Tiger Child" contained many such instances. Westminster Cathedral choir boys in formal performance are contrasted with Thai children swimming in the Klongs. Then the choir boys are released, throw off their robes, and race for the door. A Kikuyu boy leaps through the jungle onto the side panel of the screen, an impala leaps to the center, and the boy leaps again on the far side. When two subjects are compared visually on adjacent screens the result could perhaps be called a visual simile. The film-maker is saying, in effect, "The boy is like the impala, which is like the boy."

In the film "Hunter of the Sun," at the Electric Power pavilion, the five tall screens at one point presented five shots of drying squid, spread out against a window, translucent in the sun. Every other screen then changed to close shots of sunbathers whose skins repeated the color of the squid. The squid were then replaced by close shots of water buffalo, their heads just protruding, luxuriating in the cool water. What was the juxtaposition of nubile girls and water buffalo intended to convey? Sunbathing and water bathing? Women compared to cows? Hardly--not these women. Placidity, relaxation, the sensual pleasures enjoyed by both girl and beast? The viewer is free to make any of these associations he likes--he may misinterpret, of course. But because the meaning is not expressed in words, it does not register in words on the viewer. The viewer gets a feeling instead. If there is anything in common between a wallowing buffalo and a sun-drenched

subtle medium, it seems accurate as a feeling, not a process. Either image alone might convey any of a number of other feelings, but the juxtaposition of the two images on alternate screens assures the film-maker that those particular feelings which are common to both images will be emphasized.

Another example, conveying a much stronger feeling, is also from "Tiger Child." A lovely baby, left armless by thalidomide, is shown in the center image; in each corner appear shots of a wasteland, bare without vegetation, a feeling of devastation, presumably wrought by man.

Again, it should be stated that all that has been said here about artistic technique applies to pictures without words. As soon as language is used, abstract meanings are easy to get across. The artistry of "Tiger Child" and "Dances of the Dan" lay in conveying the desired feeling without words. This calls for a high level of artistic skill and is very difficult to achieve "in order," so to speak, in single still images or even in sequences of film shots on a single screen. The multi-image medium, however, puts new creative powers in the director's hand.

Perhaps the most powerful of all multi-image techniques is the use of contrast between simultaneous images. Shots of KKK figures burning a cross, on both sides of the three-panel screen, were contrasted with a steaming black baby in the center, then with a Negro fire-eater. This last, expressed in words, sounds more powerful than it actually was, since the fire-eater's expression said as to one only a performer, not a Black Panther. The side panels then changed to Japanese Kendo players who held sticks and clubs on each other with great gusto, full screen.

CONFRONTATION AND CONFLICT

The prisoners

The soldiers

A contrast of attitudes and a filmic relationship

The old world crumbles

CONTRASTING IMAGES

In a sequence conveying the feelings of fear and oppression, resentment, hostility, and explosion

A series of images made up a sequence based on rioting in the streets--shots of rocks being thrown, canisters of tear gas smoking, crowds sweeping through the streets. With three or four of these related shots on the screen, a close-up of a blind man's cane appeared top center. Amid more riot shots, he appeared again, bottom center, this time being led along with his arm on someone's shoulder. Finally at the end of the short sequence he was seen in the center panel, making his way alone with his cane, while total chaos raged all about him.' Descriptive words cannot begin to convey the intensity of the feeling which this juxtaposition of images, and of course their accompanying sounds, left with the viewer.

Total Surround (360-Deg) Projection

Expo '70 contained at least two examples of total surround projection on multiple screens at the Toshiba pavilion and at the Australian. Both used nine projectors and screens and both used 70mm film. The Australians, in their planning, decided to produce nine separate films, each of which would have the same theme but different sets of images. Occasionally three or more screens might continue to present what at least looked like one continuous image. In some instances the entire 360-deg circle showed the same shot.

The producers of the Toshiba film never combined more than three screens at once. From where I sat, about midway between the screen and the center of the 84-ft-wide arena, three screens took in about 70 deg--more than I needed to fill my field of visual attention. This meant that any other screens, beyond those three, constituted distracting action in my area of peripheral vision (I probably could see another

screen or two on each side without really knowing what was happening on them). Even this allowed me more attention to the three screens I was watching than in the Australian pavilion, where the 360-deg projection was done in high ambient light, and many other peripheral visual impressions, people as well as objects, served to distract from the screen.

In the shooting of the Toshiba film, a maximum of only three cameras were ganged together for the purpose of making panoramic shots. In comparison with this, Disney used a full circle of 11 cameras to shoot his Circlerama film which ran at Disneyland for so many years. Because this film was presented in a small stand-up arena, 16mm film was used. Of course, the effects which can be achieved by presenting a single image in full circle are quite different from presenting multiple images. Disney's film, as I recall it, was totally single-image. The illusion of being at a place, in a place, was very strong. One turned his head to look at more of the same breathtaking view. There was no distraction by one screen from the others.

The ring of synchronized Cine-Special 16mm cameras with their 200-ft magazines with which Disney shot Circlerama covered the top of a station wagon. It is little wonder that no one has undertaken a similar tour de force with a set of giant 70mm cameras. Even the three-camera assembly used for the Toshiba film appeared in photographs to extend a good 18 in. beyond the tripod head on either side. The filming of "Japan and the Japanese" for the Japanese Government pavilion required ganging eight cameras together, four above and four below, on a huge structural framework, apparently at least 6 ft high and 8 ft wide. They were evidently mechanically linked and all driven simultaneously by a common motor. Even these were not 70mm cameras--35mm film was

used in a double-frame (horizontal) format in specially made cameras. Knowing how long it takes a good cameraman to check and double-check all his adjustments and controls to make sure he is ready to shoot just one camera, I can imagine the production problem with eight at once, plus the problems of adjusting each camera to the others. I wouldn't be surprised if it would require at least a half-day per shot.

The Japanese Government multiscreen image covered less than a third of the circle. For a full surround in this format (two banks of images high), at least 24 cameras would be required, and a circular construction so wide it probably could not be transported on highways, let alone set up at scenic locations *away* from roads or tracks. Of course, high definition in the images would have to be sacrificed for portability of equipment. The full hemisphere of projection at the Astrorama, described below, required only five films; the camera for the system recorded double-frame pictures on 35mm film, with the long dimension vertical, and the five-camera assembly was compact enough to fit on a small dolly; 140-deg ultra-wide-angle lenses were required. The double-frame 35mm pictures were transferred to standard 70mm and screened by a projector which ran the films horizontally. Definition was clearly inferior to that of most of the films.

The Midori-Kai Companies, in a dome which they called the "Astrorama," presented a five-projector film on a hemispherical screen some 18,000 sq ft in area. This was indeed the biggest screen, the largest image, and probably the greatest technical achievement, cinematically, of this or any exposition. How effective was it?

The presentation was very cleverly designed. There were moments of great impact. These, of course, were moments of single-image

projection--when the entire dome portrayed the opening of a single puppy in slow motion, a sky filled with fireworks, or when the audience was immersed in an undersea world, looking up through a school of a million fish. When multiple images were used, the effect was not as great. Repetition of the same image in each of the five segments of the dome seemed to work fairly well. Naturally, the space was filled with reflected light coming from every side, so there was a problem with washed-out images as each part of the screen cast ambient light on all the rest. Naturally the screen was curved, so vertical lines were never vertical; full-frame human figures became huge bowed-over paper dolls with their heads nearly joining in the center. If the viewer does not stand in the very center of the floor, where of course he must tilt his head very far back to see anything, but stands instead back toward one of the sides where viewing doesn't give him such a pain in the neck, he is so close to at least two of the panels of projection that the images are badly distorted on them, and so he leaves them at his back. The projection of each panel was so large that close-ups were gigantically close. One rarely sees another face, in real life, larger than, say, 5 or 10 deg. A face spread across 60 or 70 deg of vision would have to be less than 6 in. away in real life--hardly a comfortable distance to look at people other than sweethearts or wives. So the close-ups didn't work.

Perhaps we should conclude that the full hemisphere screen is good for a realistic representation of reality, particularly scenes like sky or underwater that would normally fill a spectator's full hemisphere of vision. It may be quite wrong, however, to think of the sequence of moving images which are used to present this illusion as "a film."

A film is a moving picture and a picture is defined by the frame--it must have bounds, however large it may be. The producer of the frameless motion picture, lacking this limitation, is denied the effects of pictorial composition; he is unable to select parts of a scene to display while eliminating others; he is denied the various possibilities of pictorial emphasis, the camera angle, and the cut. Obviously, he can never shoot anything in a studio. His only artistic control, somewhat like the theatrical producer in an arena theater, is in the arrangement of elements of the scene itself, without even the possibilities of controlled lighting.

Standing on the floor and looking up into a dome for any length of time is unpleasant to say the least, even when you are provided with railings to hold onto and lean against. In the Rainbow Tower the audience was provided seats with reclining backs and could thus comfortably watch the "smoke show"--a combination of colorful animated mosaic panels, clouds of dry-ice fog, smoke rings, and effective lighting--which all took place high in one of those great domes which seemed to be very common at Expo '70.

Maybe at the next exposition someone will tilt the hemisphere back some 60 or 80 deg and seat the audience on a steep "people wall" like Charles Eames's system at the IBM pavilion in New York in 1964. Then they will already be "leaning back" in relation to the dome in front of them, and can look from horizon to horizon without neck strain. The artistic possibilities open to the "film" producer will be much greater, since he can then create sensational illusions with shots in which the photographed horizon is fairly dead ahead, at least for the middle audience rows, instead of somewhere up where you are used to looking at the constellation of Orion.

Almost any kind of single-image shot should be effective in the tilted dome. There may be a lot of ground showing in some shots, and there will generally be a lot of sky--but that is what we are used to in our peripheral vision and adds to the illusion of being there. The popular large-screen extravaganza shot, taken from the front of a plane as it winds through canyons and skims treetops, would fit this format like a glove.

Remember the people who used to complain of nausea in the early Cinerama films? Producers of wide-screen films have learned not to put their cameras on roller-coasters anymore, or on any equivalent wildly moving vehicles. The designers of wide-screen driving or helicopter simulators tell us this nausea is due to sensing movement visually without any of the accompanying kinesthetic sensations. If this is so, the sensations of movement, or at least some of them, could be simulated by tilting the viewer's chair to accord with the tilt of the image on the screen, using gravity to simulate centrifugal force, thus reducing the hazard of nausea.

This was done at Expo '70 in connection with the Hitachi pavilion's flight simulator. At this exhibit, 16 simultaneous groups of eight persons took a brief flight in an airplane simulator, two as pilots, six as backseat kibitzers. During takeoff and landing, pilots watched a color-TV display which showed the live shot from a large airport terrain model, then during the flight they watched a film taken from the nose of an airplane. As each pilot moved his control stick, the floor of his cockpit would tilt accordingly, giving everyone a very realistic ride. While individual seat-tilting might be accomplished, especially if all seats were ganged together mechanically, another way to accomplish this

might be to fill the entire audience wall. Looking a little further ahead into the future of spectacular illusions, we may see someone create the entire projection and audience together. This could be most easily accomplished if the audience and projector system moved together, while the screen remained fixed, but actually covered more than half a sphere, to allow for the proposed range of movement.

This may sound expensive, but I doubt if it would be much more elaborate than the Mitsui pavilion's great dome with three space platforms, each carrying 80 persons, that slowly circled each other, rotating, rising, falling, moving out and moving back, while on loose an event than the origin of the universe took place to gigantic film projection and gigantic sound on all sides.

Thus, I believe it is safe to predict little future for the huge-audience, 360-deg film presentation where a single image is projected on all sides at once, whether these images are extended upwards so that they meet overhead or not. The effect is magnificent when the screens subtend a large vertical angle (such as the Japanese Government's two banks of screens). But to prepare such a multicamera film in the large film format required for huge-audience presentation is prohibitive.

As for 360-deg presentations in which something different is happening on each screen, these I can now perfectly well do without. I am willing to settle for looking in just one direction; it is more comfortable anyhow and generally I will be provided with a theater seat to relax in. Stand-up presentations have to be very brief. Multiple-screen surround is all right for a quick general impression on a superficial basis, but you can't get interested in the action on any one screen without feeling you are missing something somewhere else. Thus, the constant distraction of one screen from another reduces your attention and involvement.

The motion-picture art has several decades of development ahead in the exploration of the artistic possibilities of multiple images that do not distract from each other but support, complement, and enhance each other. I think we will have to wait until film-makers have thoroughly explored these possibilities before we can expect 360-deg surround films with multiple images to be anything but superficially sensational.

Three-Dimensional Projection in the Russian Pavilion

Three-dimensional projection of both slides and films were displayed in the Russian pavilion; the slides were constantly on display by means of automated projectors in the general exhibit area. The film was shown on a scheduled basis, once or twice each day. In one respect the slide projection was the most unusual.

The automatic slide projector that I observed utilized nine lenses, each about 3/4 in. in diameter, and projected an image about one meter square on a glass-covered screen. Nine different images were projected. This made it possible to "look around" the edges of a nearby object, and to see it from constantly changing angles. If you closed one eye and moved the head to the right or to the left, it was possible to see a full sequence of nine pictures, each differing slightly from the last. After the ninth image a wide shadow, fully half the screen width, moved across the screen, and if the head continued to move in the same direction, the sequence was repeated. It seemed that the head moved about a foot to produce the sequence of different images, about the width of the array of nine lenses on the front of the projector.

However, it is possible that everything was not in perfect adjustment. There were soft vertical streaks maybe 10 percent of screen width wide appearing in one eye's picture or the other. Because of the shadow streaks, this display was less than satisfactory.

The Russian three-dimensional film was projected on a screen which was 13 ft wide and nearly 10 ft high. This is the largest size screen which has yet been developed for this film system, and the screen is the key. The projector emitted a double beam from lenses which appeared to be only a few inches apart. The film used was 70mm, carrying two images side-by-side, each about the size of a standard 35mm film image. Before the film began the curtains opened to reveal the screen; its lenticular surface gave the impression of rays radiating upwards from the bottom center.

There was a striking three-dimensional effect, without the requirement of wearing glasses. This effect was achieved only when seated in the middle of the seat. If one leaned one way or another the effect was lost, and was not achieved again until one had moved his head at least halfway to the next seat. Is it possible that the screen must be lined up so accurately with every seat in the theater? Obviously, only the center area of seats were capable of receiving the effect, since the people were encouraged to move into the center section before the start of the film.

There were moments of high effectiveness. During a ballet sequence one of a pair of dancers had left the screen, then suddenly reappeared, entering from the lower corner of the frame. At the time my eyes, of course, were on the single dancer in center screen, so I saw the entrance in peripheral vision instead of directly. For a split second

I had the distinct impression someone had risen from the audience and was moving toward the screen.

This is because the spatial placement of this near object was forward of the screen plane. The same was true, conventionally, of foreground objects, such as a bush or rock, in a landscape which lay largely behind the screen plane. Such a foreground element often looked very peculiar extending out so far from the screen. It did not seem to be part of the same picture. A shot through a continuous screen of foreground greenery, however, did not give this disconnected effect.

There are obviously many things we are accustomed to doing with two-dimensional film which cannot be done in 3-D. I am sure that those Hollywood film-makers who worked in 3-D movies a decade ago discovered these, because I don't recall the problems which I describe below.

Panning, for example, cannot be done too rapidly or the eye will become confused between what is supposed to be the next image for the left eye and what is supposed to be the last image for the right eye. Nearby objects, particularly, are hard to keep in depth perception during rapid panning, their position changes so fast from frame to frame that the eye sees only double images.

In some shots, where there were objects in the foreground, one could either look at foreground or at background, but not at both at the same time. The natural attempt of the Soviet cameraman to compose pictures framed by foreground objects, limbs of trees, fountains of water, and the like, often met with failure because when the scene has maximum depth, apparently, pictorial composition is least possible.

To illustrate this for himself, the reader should raise his arm as a foreground, looking also past it at the room beyond. With one eye closed it is possible to arrange the foreground in relation to the background so that the two make some kind of reasonable pictorial composition. With both eyes open, however, this is a total impossibility. One can focus the eyes on the arm alone, or on the background alone, but the two cannot be looked at together. That which is not being looked at is seen in double image and thus tends to be disregarded.

There is also a limitation to the speed with which the film can change from shot to shot in subject matter, and vice versa, since it takes a certain amount of time to refocus and adjust the eyes. For example, a steel mill scene, in the film shown, showed a long shot of a sheet of steel coming toward the camera from between the great rollers. The film-maker then cut, as any editor would, to a close-up of an operator watching the process, then back again to the long shot at a later stage in the rolling process. Unfortunately, for me at least, it took so long to adjust to the next shot that it was barely glimpsed before it was gone and the adjustment had to be made back to the long shot again. In the few seconds during which this adjustment was taking place, of course, I was simply seeing double.

Watching this film was not easy. One had to work too hard to maintain the illusion of depth; it was not possible to forget about the illusion and pay attention to the film. Evidently this was too much for many in the Japanese audience. Even the opportunity to sit down and relax for awhile in an air-conditioned theater was not inducement enough to hold even half the audience until the end of the short film.

I do not recall any such difficulties with the 3-D films of the polaroid spectacle days. Since these were mainly studio productions, as I recall, it may have been possible to arrange continuous transitions from one plane of depth to another. As long as the transition was continuous, I suspect, the eye had no difficulty, even when the change was rather swift, as when something was thrown at the camera. With the Russian documentary type of film, however, individual shots were cut together and something was constantly happening to destroy the fusion of the two images and leave the viewer with a double image to try and combine.

Sound

The spectacular motion-picture projections at Expo '70 were of course accompanied by spectacular sound. Whereas much in the way of motion-picture sound is paid very little direct attention, because of the primacy of the visual perception, the sounds accompanying most of the Osaka productions were unusual enough to be noticed and singled out, at least in retrospect, as major contributions to the presentations' effectiveness. Whereas the visual effects were in most cases experimental, effective in some ways, ineffective in others, it seemed that the problems involved in effective sound generation and reproduction have been far more satisfactorily solved. The audio component of the big media extravaganzas was, to my judgment at least, magnificent.

The acoustic problem of big domes with curved surfaces which can act like huge whispering galleries to focus sound from a specific source to a single specific destination or which have a high reverberation factor, was overcome by using a multitude of speakers. The Fuji pavilion

used 126 speakers, the 360-deg dome projection, Astrorama used 515, and the big Mitsui "Tour of Space and Creation" surrounded the visitors on their huge "space platforms" with 1,780 speakers.

The use of large numbers of speakers was probably the reason why such an immense volume of sound could be generated without causing any distortion. The sound experience was totally enveloping, like most of the visual presentations attempted to be. Not only did the sound fill the full volume capacity of the human ear, and the full frequency range of human hearing, it also appeared to come from all possible directions: front, side, back, above, and in one case (the Gas pavilion) the sound also came booming at the listener from below his feet.

In addition to new ranges of volume frequency and source direction, a wide use of synthesizer music brought many new sounds to the ear which had never been heard before. Several pavilions, such as the Pepsi pavilion, the pavilion of West Germany, parts of the Eastman Kodak pavilion, and the Japanese textile industry pavilion, featured this new music, accompanied by various kinds of light shows, some of which included motion-picture projections. The highlight of the Textile pavilion, for example, was a high dome under which people were supposed to stand and look up, but preferred to sit. The dome was covered on the inside by huge three-dimensional parts of bodies--heads, arms, breasts, thighs, etc.--on which images were projected and which were lighted in various weird and dramatic ways. Ten 35mm film projectors and eight slide projectors were incorporated into this multi-sound-and-lighting system.

The Textiles Association description of the pavilion, graciously prepared in an English translation, describes the effect in more vivid words than I can command.

> ...while six of the 35mm movies will be projected on the reverse side of the [dome], the remaining four, and slide pictures, will be projected not only on the front side...but also on every configuration of the wall and image reliefs, intermingling with sounds, music, and rays and flashes of light in various colors, all of which will come from everywhere in the dome; ceiling, wall, and floor. All these plans were devised by Toshio Matsumoto, a well-known movie director.
>
> Accordingly, spectators in the dome, being in the pot of mixture of these visual and acoustic effects, are expected to experience some queer sensation unknown to them before. To see a picture on a screen and to hear sounds are nothing new. But this intermingled projection of imagery pictures, lights, and sounds from every corner to every part of the dome is far different from traditional movies, and gives an entirely different impact on the senses and perception of spectators.

The effect was indeed far out. Our young people would have really dug it. I wasn't sure whether I liked it or not, but I felt that was immaterial. I intended to get back for another perception but I never made it. I'm afraid that the other visitors joined me in being so stunned by the gigantic unusual that we didn't know how to take it and walked out in a kind of daze, not really sure what had hit us.

Some Thoughts on Media Presentation at Expositions

Films and slide shows were presented under several different general conditions at Expo '70, each of which required a somewhat different kind of production. The first of these was the presentation in a "free-flow" area, where people were expected to stop for a moment, look at the film, and move on. Many regular exhibit areas had films running continuously (reentrant loop projectors), usually projecting on rear-projection screens because of the high ambient light. The Soviet pavilion displayed 3-D slides in this manner, as well as two major film presentations using the variscope technique. The largest walk-through

film of all was the Australian pavilion 360-deg wrap-around which was presented in what was considered to be a waiting area. In some cases a few seats were provided for walk-through films, but this was not always satisfactory since walkers were often crossing in front of sitters.

Were I a film-maker creating for an exposition, I think I would make sure my contract specified that my masterpiece would not be shown under such conditions. Walk-through films appeared to attract very limited attention. Part of this was probably that they were shown in general exhibit areas where they had to compete for attention with countless other objects, displays, projected and transilluminated images, and so forth.

All other methods of presentation captured the audience and forced it to give full attention, for a limited time, to the film alone. One of these methods I shall call the "ride-through" as opposed to the walk-through. Previous World's Fairs have used elaborate ride-through devices, such as moving trains and deep armchairs with individual speakers next to each ear, which toured the spectator through the exhibit. This sort of conveyance is permanently installed in Disneyland's Haunted House. There was very little of this sort in the Expo '70 pavilions I visited. Instead, relatively heavy use was made of the moving sidewalk. The Fuji turntable was an example of ride-through, although the net result of this was not to bring new displays into view, but to vary the visitors' angle on the one huge presentation. The Japan Local Government pavilion rode people by a large number of projections, in gondolas carrying six people each.

The most elaborate ride-through display was the Netherlands pavilion, in which a succession of escalators and darkened corridors directed

the visitors past one screen after another. The darkened corridor captures the audience nearly as well as a ride-through system, the idea being that only enough is displayed that the people can continue walking and not miss anything.

In the third type of presentation situation, the audience is admitted into a theater area, but expected to stand rather than sit. This is not always what they did, of course, especially if the floor was carpeted they generally sat down, as visitors will do at any World's Fair after a few hours of walking. When rails and stanchions were provided for leaning against, sitting was impractical. In one case the rails were low and padded, so people could half sit. Presumably, a considerably larger audience can be accommodated for a stand-up show than an auditorium with seats can handle, and for a crowded fair this can be a very practical consideration. Since the Fuji pavilion turntable was a stand-up system with railings, and the film shown there had, for me, the greatest impact of all the films at Expo '70, I cannot conclude that stand-up films are not effective. They must be short, however, 15 to 20 minutes is a maximum length.

The final type of presentation is the cinema theater, in all its various forms, where the audience is allowed to sit down, relax, and view a film in the normal manner. This is certainly the best way to treat a film, and is especially appreciated by the weary foreigner, particularly when the comfortable seats are also in an air-conditioned environment. However, the tradeoff is obvious. The lower-capacity theater, and the somewhat longer show, means a longer wait outside and a larger number of people who would have liked to see the show but didn't care to make the wait.

People at expositions are not generally in what one could call a contemplative mood, at least not all the time. But at the usual overcrowded exposition, periods of great information overload alternate with periods of total information drought for the average visitor, made all the worse by the general level of excitement that pervades the atmosphere of a fair. If a visitor wants to see some of the more popular pavilions and the big shows, he can easily spend as much time standing in line as he spends doing all the other things one does: eating, visiting exhibits, or just walking around. Time in line frequently exceeds the time actually spent in the pavilion one is waiting to see by five or six to one.

Yet the visitor in a pavilion is not considered until he actually enters the door, even though he may have waited an hour or two in line. What has he done during that time? Generally nothing--stand, squat, sit intermittently when possible, look at the other people, fan himself. During these long periods of enforced emptiness nothing whatever is done to take advantage of his high receptivity. He is perforce in a contemplative situation. He is bored--he would pay attention to anything put before him. To the exhibitor, evidently, a line of people is just a line of people; they don't become visitors until they get inside. About the only thing done for them at Expo '70 was to organize queuing lines with portable ropes and stanchions, and to supervise these where they had to cross streets so the people wouldn't actually block traffic. Some of the pavilions mercifully provided shaded areas for the last half-hour or so of waiting.

It is not an exaggeration to say that at the Osaka Fair, at least toward the end of the season, more people were waiting in line during

the major part of the day than were inside all pavilions. Waiting times of 2 and 2-1/2 hours were frequent, and even a 4-hour wait was reported. This may have taken place on a day like Saturday, August 13, when 686,000 people entered a fair that was intended to hold a maximum of 250,000.

What might be done to entertain or inform the visitor during his long wait in line? Obviously, the outdoor waiting line is not a place for film or slide exhibition. But some media might be used. The printed word, for example. Every pavilion has a printed folder which they hand people as they enter the door or as they leave. No one has evidently thought of giving this piece of reading matter to the visitor to study while he waits in line. The visitor could arrive finally at the entrance to the exhibit well read on the subjects he was about to see, and know exactly what he wanted particularly to look for.

The audio medium might also be used. In addition to occasional hull-horn announcements by a pavilion guard giving information about the expected length of wait, interesting background material could be presented, dramatizations, descriptions of the exhibits, as well as entertainment and music. Small speakers could be attached to lampposts along the route of the queue, or if this interfered with other Fair activities, cheap radio-reception headsets could be distributed, even if a small charge had to be made. Much of what most pavilions intend to accomplish could be either achieved or greatly assisted by a prologue of print or audio or both in coordination, presented to the visitor while he quietly waits in line.

The Australians thought they had done something toward solving this problem. After seeing the long lines at Expo '67 in Montreal, they decided to take care of their waiting audience, and they built a

large structure to cover the waiting lines and house a major 360-deg panoramic film of Australia. Conceived as a waiting area, this building was designed more as a sheltering roof than a closed pavilion. Suspended by a huge sky-hook, it looked to someone like "a dinosaur holding a bird-cage in its teeth." It was actually nothing but a roof, open to the air around the sides, and hence the film was subjected to a high level of ambient light. In addition, since the people were in almost constant movement as they spiralled through the structure, the whole became a kind of walk-through exhibit, with animated wall decoration, and the film failed to command full attention.

In actual practice the intended "waiting area" looked to all visitors as a major part of the pavilion itself, and the entrance to the waiting area became the entrance to the pavilion proper. The result was simply to hide the waiting line, and to give the impression that the part of the line that extended beyond the outer entrance was the total length of the queue. Hence, the outdoor line quickly built up and maintained itself in a long line around the building, just as with all the other major pavilions.

As of this writing, the Osaka Exposition is rapidly drawing toward its scheduled close. Already a Saturday attendance of 836,000 people has broken (by a 15-percent margin) all one-day attendance records for all World's Fairs in history. The following day the gates were closed at 3:00 p.m. and the fairgrounds declared full. Nine-hundred-sixty people per square acre was considered enough. The record attendance of 836,000 exceeded by more than three times the 250,000 that the Fair was designed to hold at any one time. If the authorities decide, as New York did, to run the Fair for a second season, I, at least, will do all in my power to make the scene a second time.

A Visit to the NHK Education Department

On arrival at the Tokyo station, as the world's fastest train slid to a smooth stop, I was met by Shozo Usami, TV producer and head of English language teaching at NHK. He had been one of the early television trainees at NHK in the middle fifties, when the translation of my book "Techniques of Television Production" had been their bible. NHK now feeds a network of over 600 color stations with entertainment and other general-interest programs, and another network of 600 color stations which are entirely educational. Japan also has competing educational stations which broadcast commercials and operate strictly as business enterprises. One hundred of the 600 NHK educational stations can originate their own programs, although they usually take 90 percent of their programming from Tokyo.

Educational television is considered a supplementary resource by Japanese schools; its use in the classroom is always left to the discretion of the classroom teacher. Almost all subjects are covered by broadcast programs. English used to be the most popular subject, but in recent years audio tape is being used increasingly to teach such aspects of language as pronunciation, and English-language TV has become second to science in popularity.

English is taught on four different levels for in-school use, the highest being the senior high-school level. Three programs are done on each level weekly of about 20 minutes duration each. This means that 240 minutes of program is produced weekly for in-school English language teaching.

In addition evening courses are broadcast as part of the correspondence school program. Many housewives seeking the senior high school degree are enrolled in such courses. English is taught on three levels for this audience; each level receives a half-hour program two nights a week. This totals up to 180 minutes of programming weekly. These programs differ from the in-school broadcasts in that they attempt the total job of teaching; there is no planned sharing of the instructional task with classroom teachers.

A third area is adult education programming. For this audience there are six programs a week of a half-hour each, broadcast at 6 a.m. and repeated again at 7 p.m. The emphasis is on English conversation in these programs; five of these teach American English and one teaches British English pronunciation. The total broadcast amounts to 300 minutes, although only 180 minutes is produced. Some 350,000 textbooks have been sold for this course, but it is assumed that the regular viewing audience must be at least 1 million persons.

The total broadcast time of English teaching programs on NHK is 10 percent of the entire Educational TV Service. The entire service runs daily from 6 a.m. to 12 p.m. seven days a week; this amounts to 126 broadcast hours of ETV. Of this, 13 hours consists of English teaching programs.

Since the entire network is in color, of course, English is taught in color. When I asked if there was any advantage to teaching English in color, those was able to suggest that color is useful when teaching the names of colors, or that it probably constitutes an "attraction

for the audience." Since colors themselves are not being taught, but only their names, I would imagine that direct translation would teach them just as well. If all TV is in color anyhow, what does a color English program attract the viewer away from?

Recording of broadcasts is a relatively recent thing; in the past it was considered that program quality had so far to go that programs should be redone every year. The quality has now become sufficiently good that they want to reuse programs, at least for three years.

A single educational television producer can do two 30-minute programs a week. On programs which are more complex than illustrated lectures, for instance, a floor director will work with the producer on the preparation of materials, editing of film, etc. Two shows are produced in an eight-hour studio day. A nine-man crew is required. The total personnel-per-production hour is as follows:

	PD (television producer-director)	48 hrs
	FD (floor director)	48 hrs
	SD (studio director)	8 hrs
	LD (light director)	8 hrs
2	LO's (light operators)	16 hrs
	mixer	8 hrs
	BO (boom operator)	8 hrs
3	cameramen	24 hrs
	TD (technical director & switcher)	8 hrs
		160 hrs

This amounts to 2.6 man-hours per minute of production. On days when the program is very simple and the floor director is not needed for a week of production assistance, the total man-hours are cut to 120, or 2 man-hours per minute of production.

The schedule for a typical production is shown in the NHKTV script "Thanking Someone" which is in my possession.

NHK scripts are mimeographed on legal size (foolscap) paper, and folded once, then assembled and stapled on the edge opposite the fold. Each page is thus double, making a bound-book script 7 in. by 10 in. which is used by everyone, even cameramen on their cameras. The double page is said to be easier to turn; there is less hazard of missing a page by turning two, and handling the script produces less noise.

It is significant that the pedantics of the English teaching programming as well as the production is up to the NHK. Shozo Usami has developed a very well thought out classification of conversational words and phrases and an order of teaching that makes considerable sense. ("Common English Expressions Classified by Purpose" by Yasuhiko Tsuchiya and Shozo Usami, Correspondence School, Broadcast Division, Education Department NHK.)